**Program Executive Office**
**Command, Control, Communications,**
**Computers and Intelligence (PEO C4I)**

# PMW/A 170 Advanced TDMA Interface Processor (ATIP) Industry Day

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*Statement A: Approved for public release, distribution is unlimited (04 December 2008)*

# Welcome to the ATIP Industry Day!

- **Opening Remarks**
- **Purpose of this Industry Day**
  - Introduce Industry to the PMW/A 170 ATIP technical requirements and SOW
  - Receive industry feedback on the Draft ATIP Statement of Work (SOW) in preparation for a potential Request for Proposals (RFP)
  - Address industry questions pertaining to ATIP via written Q&A

# General Instructions

- Overview of Facilities:
  - Emergency exits are located on the south side of the Tropic Surf conference room
  - Restrooms are located outside the Tropic Surf conference room off the small foyer

# Ground Rules

- **SPAWAR Contracts/Legal Team**
  - **Karen Rainville, Procuring Contracting Officer (PCO)**
  - **Michael Ferlo, Contracting Specialist**
  - **Oanh Ho, Legal Counsel**
- **The ATIP procurement is in the acquisition planning phase only**
- **Information contained in the presentation is subject to change and does not constitute a Request for Proposal**

# Ground Rules

- **Questions are encouraged. All submitted questions, and answers to these questions, will be posted on the SPAWAR E-Commerce website.**
- **Questions**
  - **Questions may be submitted in writing during the Industry Day or submitted through the SPAWAR E-Commerce Website. (https://e-commerce.sscno.nmci.navy.mil)**
  - **Written copies of all questions and answers (along with copies of the slides and any other info) will be posted on the SPAWAR E-Commerce website**
- **Industry Day Participant List and the Industry Day Brief will also be posted on the SPAWAR E-Commerce website**
- **No side bar discussions with Government Representatives**

# Schedule

- **Sign-in: 8:30- 9:00**
- **Briefing: 9:00-11:00**
- **Question Submittal: 11:00-11:30**
- **Lunch: 11:30-1:00**
- **Question/Answer: 1:00- 3:00**
- **Vacate Room: 3:00-3:30**

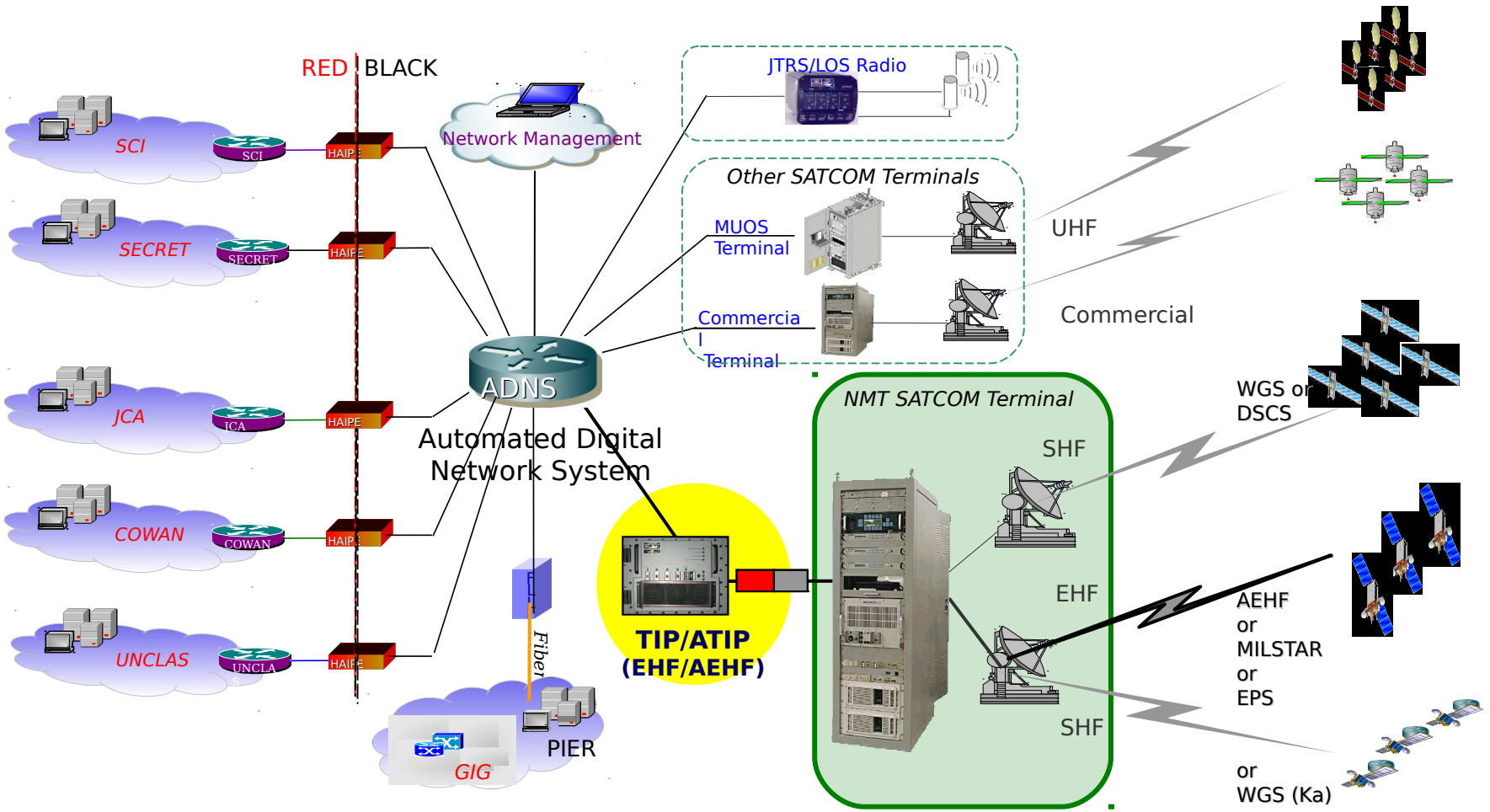
# Agenda

- Background
- Legacy TIP Overview
- ATIP Requirements Overview
- ATIP Requirements
- ATIP SOW Highlights

# Background

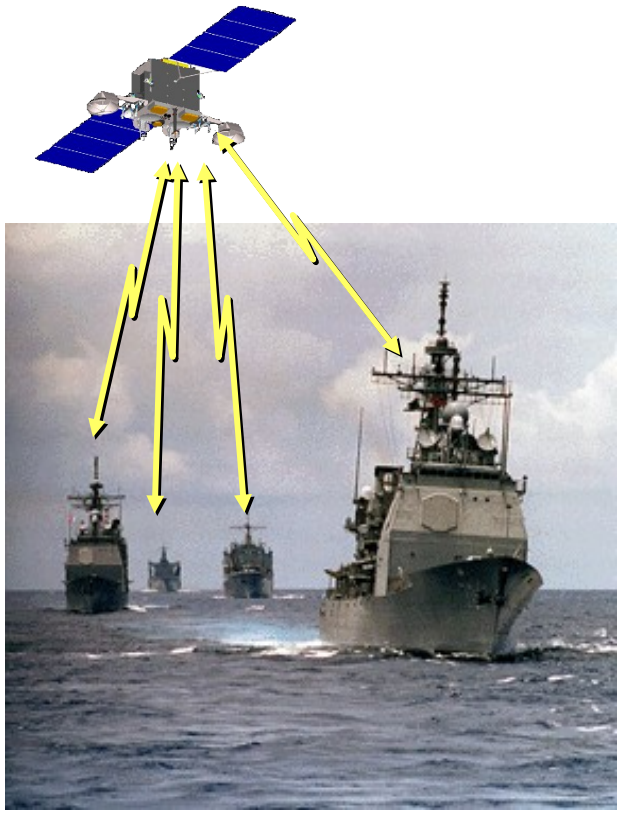
# Navy Afloat Architecture Overview

*(Voice, Video, Data Using Protected SATCOM)*




**TIP Supports ADNS Ship to Ship/Shore WAN Connectivity**

# NMT Overview

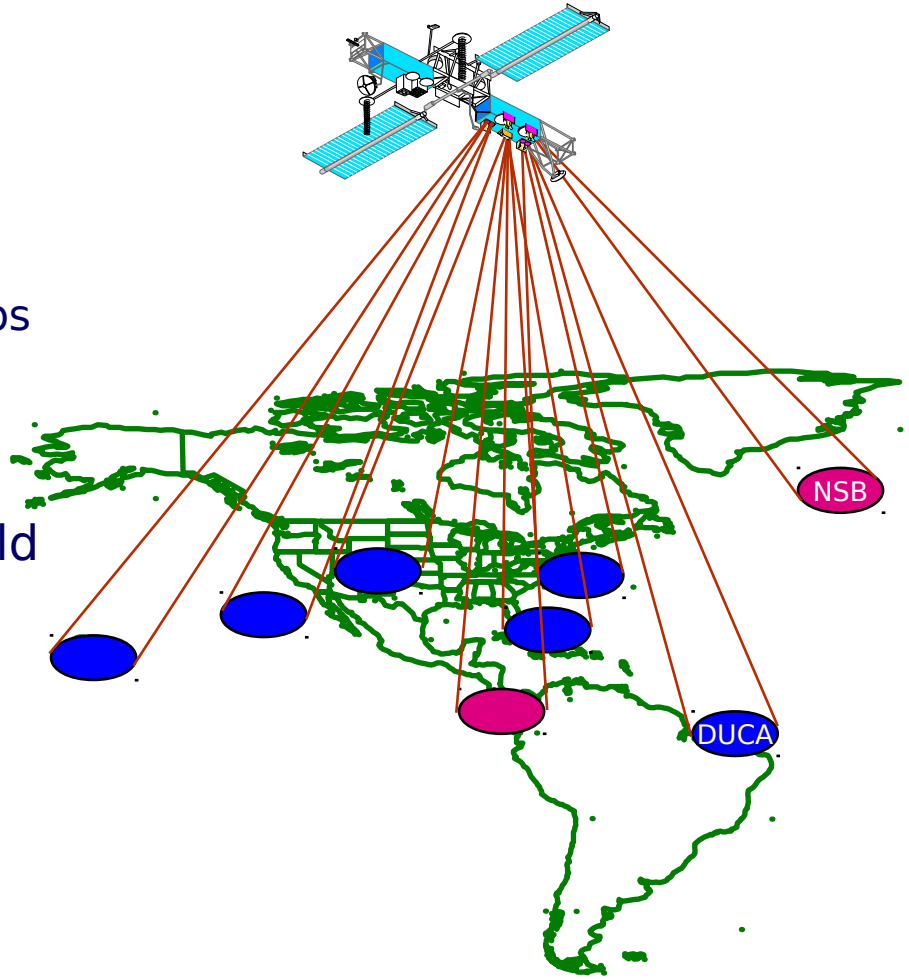


*NMT is the Navy's future wideband and protected MILSATCOM terminal*

- Multiband SATCOM terminal for ship and submarine platforms, protected SATCOM terminal for shore
- Multiband Features:
  - A/EHF LDR, MDR, and XDR using AEHF, Milstar I, Milstar II, UFO/E, UFO/EE, Interim Polar, Enhanced Polar Payloads
  - Military Ka using WGS payload with external modem
  - X-band DSCS and WGS payloads with external modems
  - GBS receive with UFO/EE or WGS on ship Q/Ka and X/Ka antennas and Sub Mast
- TIP/ATIP connects to the NMT serial interface(s) via crypto to provide SATCOM over EHF MDR & AEHF
- International Partner Variants (IPV) provide coalition partners access to AEHF capability

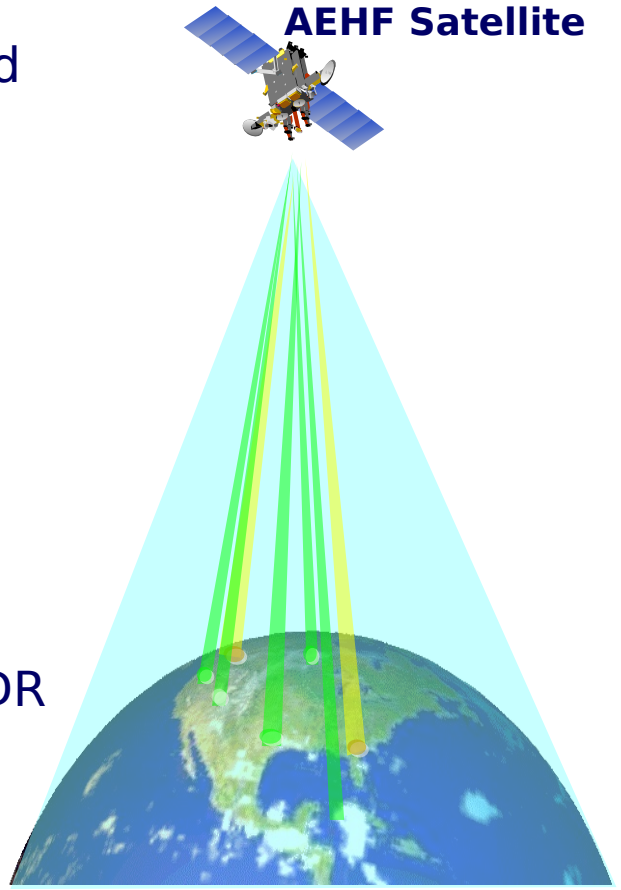
# EHF MDR SATCOM Overview

- Capabilities:
  - Provides Core C³I For Deployed Users
  - Protected communications
    - Data Rates 4800 bps to 1544 Kbps
  - Provides interoperability among Army/Navy/Air Force
  - Three operational satellites in orbit with crosslinks provide world wide coverage
  - Provides 8 spot beams per satellite
  - Supports Point-To-Point and Point-To-Multipoint services
- TIP uses multiple EHF broadcast services to provide full connectivity among all members



# AEHF Overview

- **Capabilities:**
  - World wide coverage will be provided by multiple satellites
  - Protected communications
    - Supports backward compatible Milstar LDR/MDR waveforms
    - New Extended Data Rate (XDR) waveform supports higher data rates
      - Data rates 75 bps to 8.192 Mbps
    - Significant capacity increase over Milstar MDR
  - International Partners (UK, The Netherlands, Canada) able to use XDR
- **TIP/A**TIP will use multiple AEHF broadcast services to provide full connectivity among all members



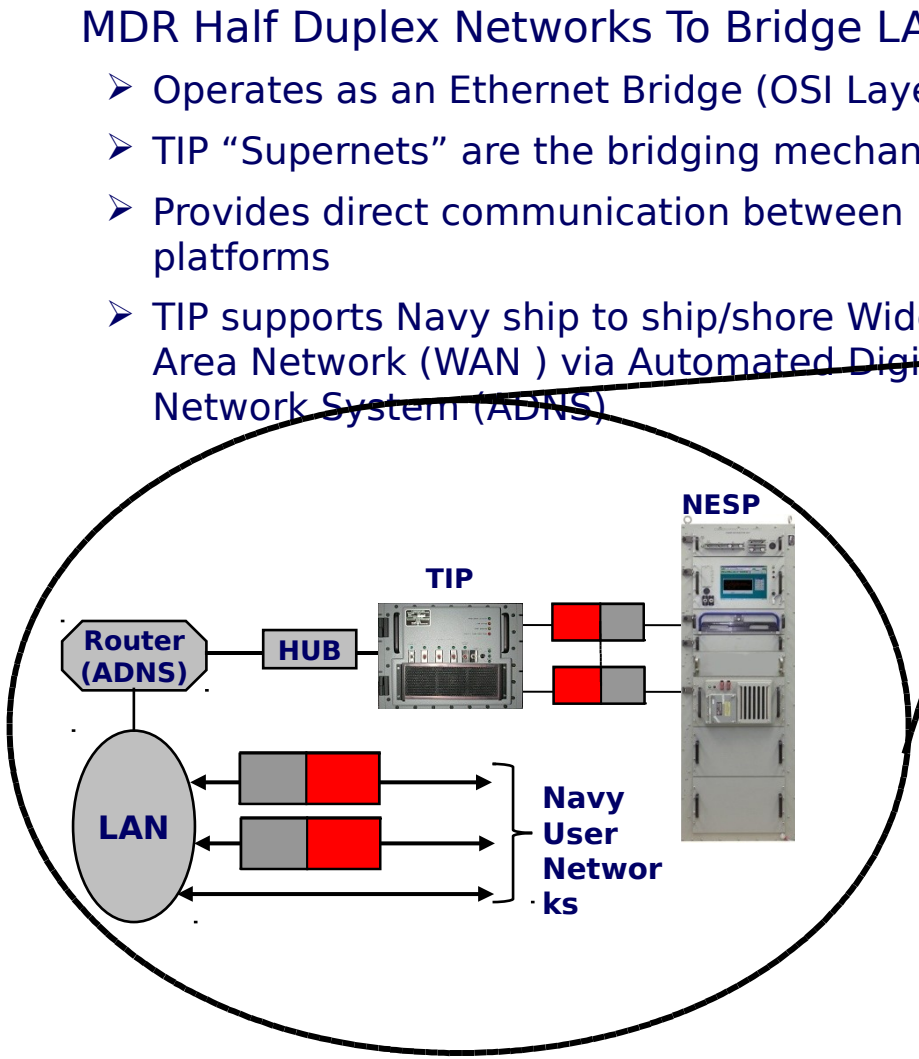
# Legacy TIP Overview

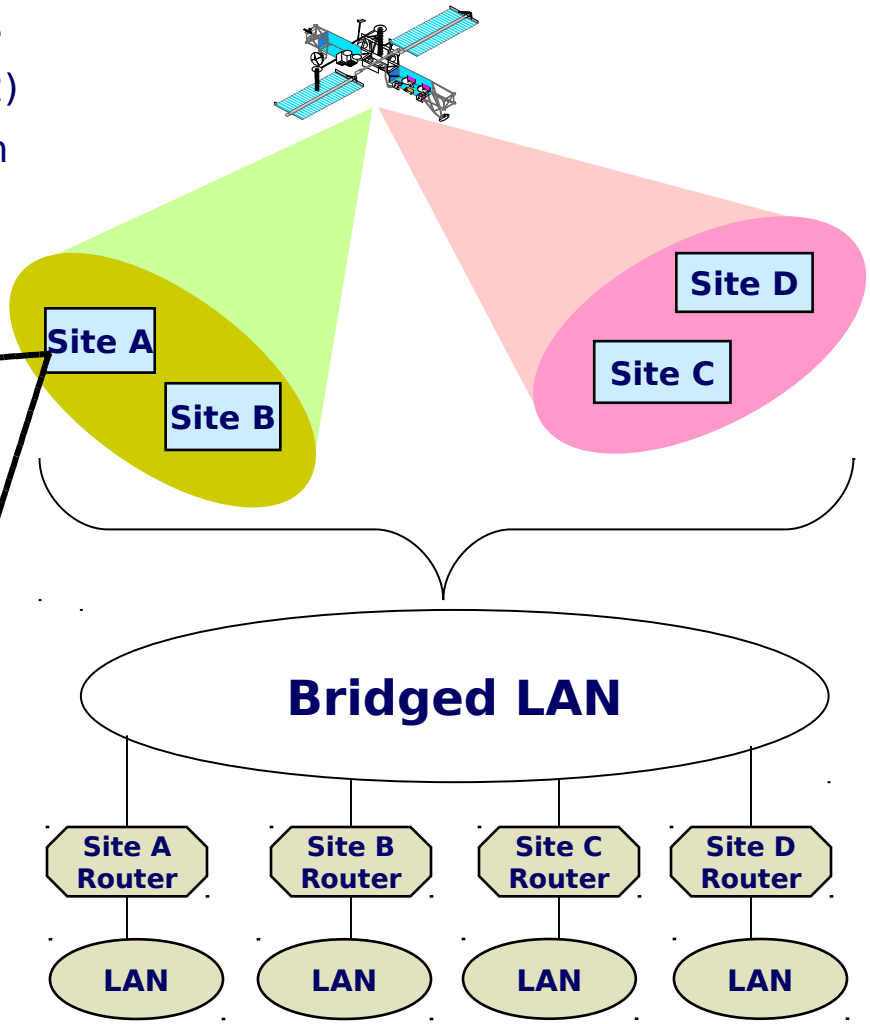
# Legacy TIP Overview

- TIP provides efficient use of limited MDR EHF resources
  - Time Slots (bandwidth) assigned dynamically among participants based on TIP member queue reports
  - Simple priority queuing supports effective delivery of high priority traffic
- TIP improves survivability through direct communications among member platforms and supports world-wide connectivity
  - Within an individual Supernet, all member TIPs communicate directly
- TIP operations are automated once members join a TIP "Supernet"
  - Automatic management of member transmissions
  - Automatic rejoin of the Supernet following reset/power loss

# What is TIP?
## TIP is An Ethernet Bridge

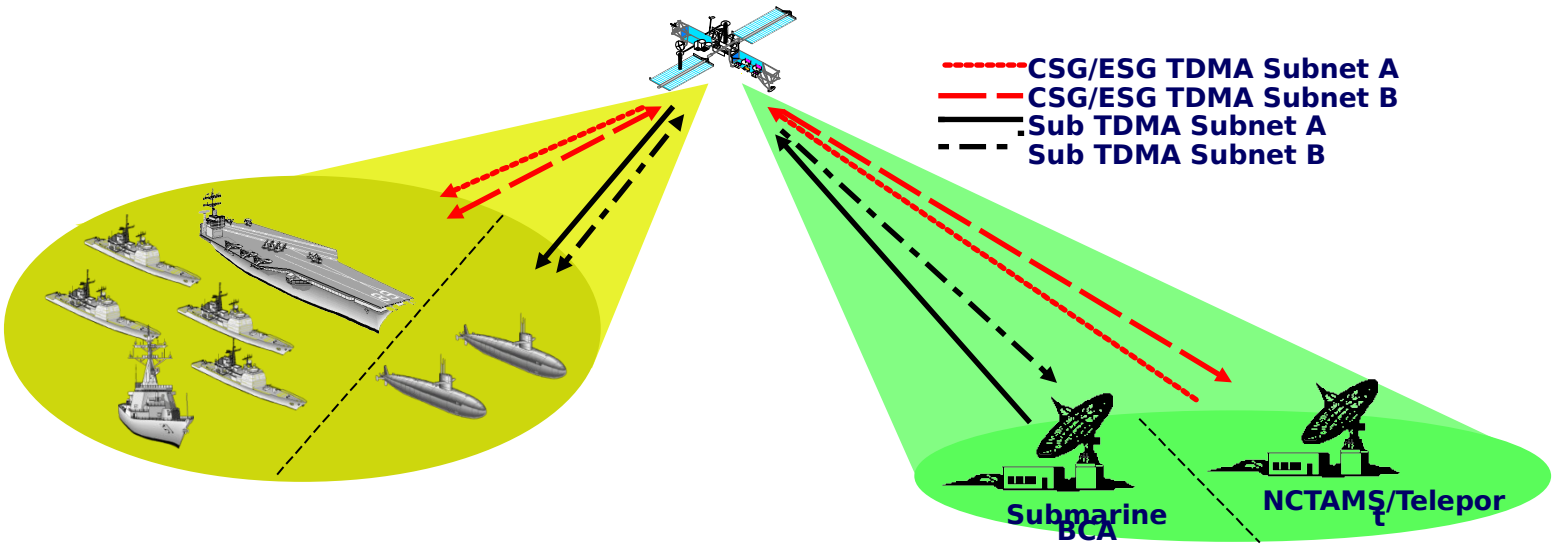
- TIP Extends IP/Ethernet Connections Over MDR Half Duplex Networks To Bridge LANs
  - Operates as an Ethernet Bridge (OSI Layer 2)
  - TIP "Supernets" are the bridging mechanism
  - Provides direct communication between platforms
  - TIP supports Navy ship to ship/shore Wide Area Network (WAN ) via Automated Digital Network System (ADNS)



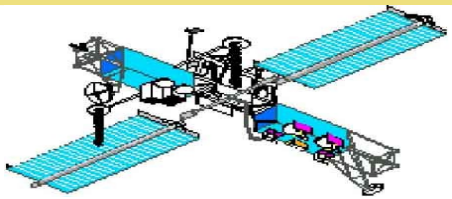



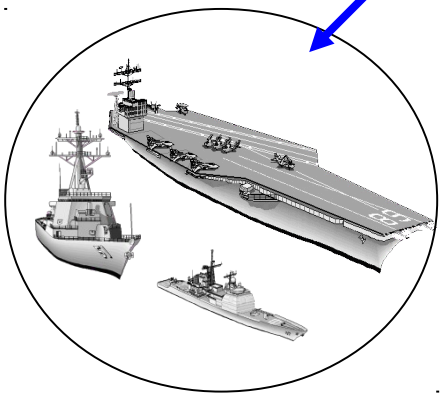
# Typical TIP Supernet Topology

- TIP uses the term “Supernet” to denote the collection of EHF services that function as an Ethernet bridge
  - The individual EHF services that comprise the Supernet are used to form TIP TDMA Subnets
  - Each TDMA Subnet uses an MDR Half Duplex broadcast service (up to 1.544 Mbps)
  - TIP TDMA Subnet parameters are configurable (e.g., data rates, Time Slot size, TIP Subnet parameters)
- Each TDMA Subnet has a TDMA Net Controller (NC) for defining the TDMA parameters and directing member transmissions in the TDMA Subnet
  - Direction accomplished through in-band transmission of a Sequence Order List (SOL) which defines transmit order within the TDMA Subnet
  - NC allocates member transmission assignments in accordance with member data transmission needs



# Single Beam, Single Supernet Example



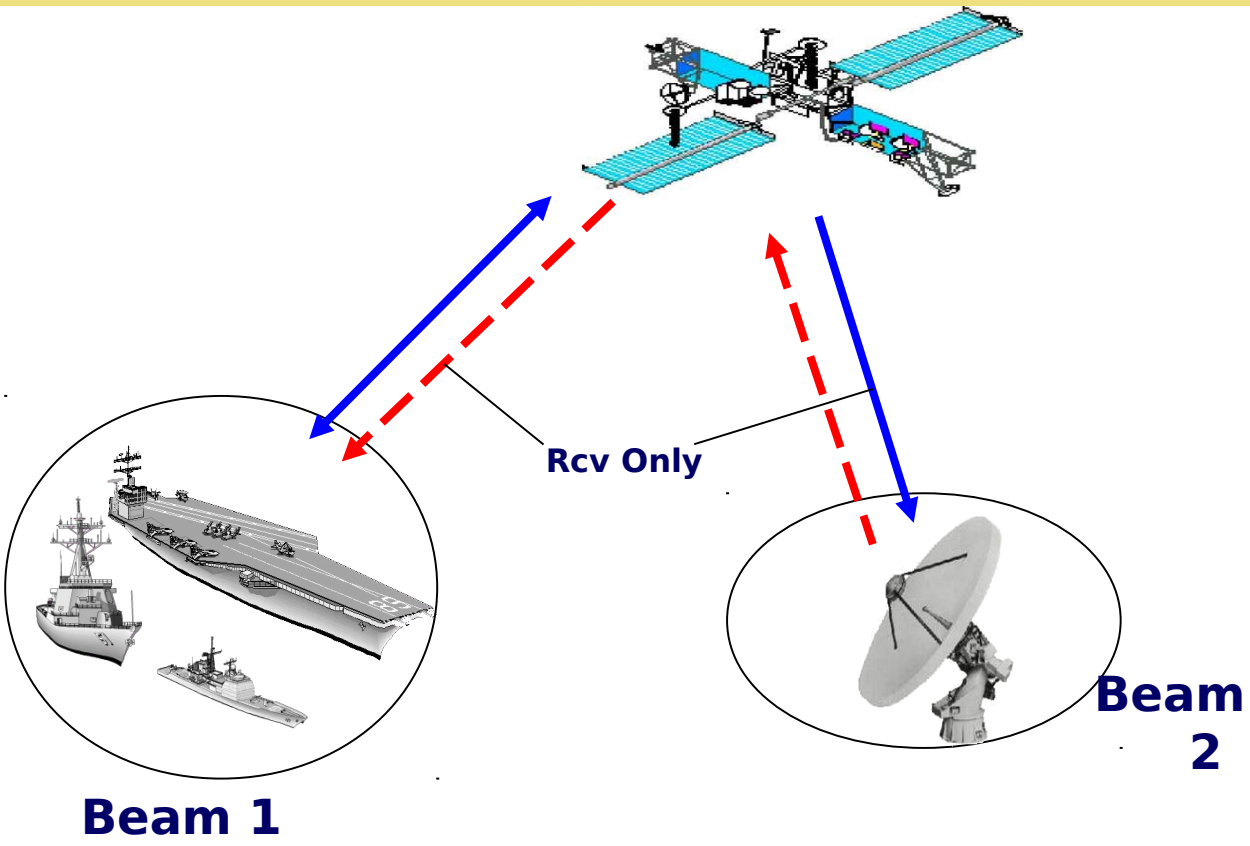


**Beam 1**

**MDR Net 1 (TIP TDMA Subnet A)**

- **Units in Beam 1 establish a TIP TDMA Subnet A to communicate with each other, joining Tx/Rx.**

# Multi-Beam, Single Supernet Example

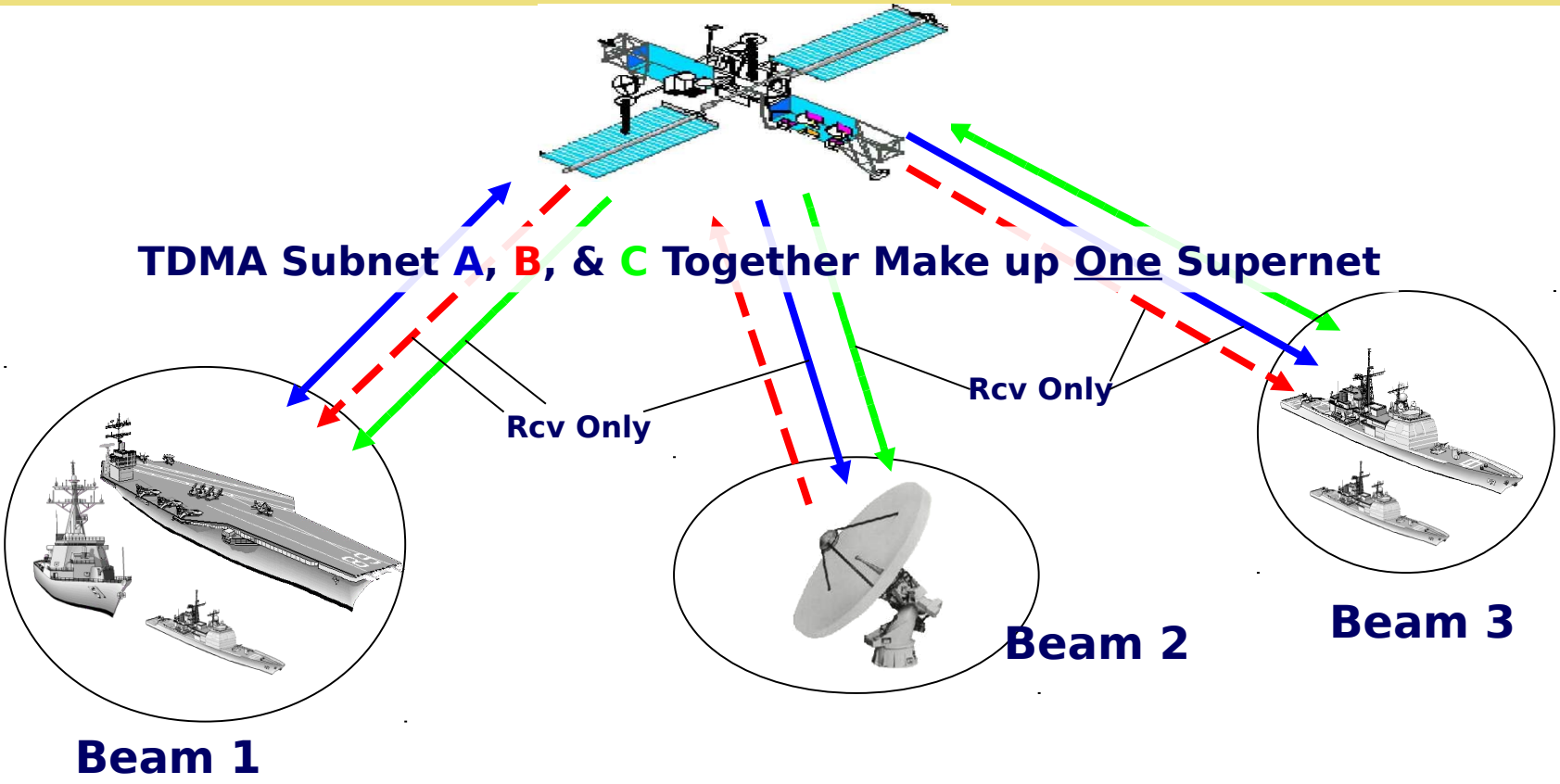



MDR Net 1 (TIP TDMA Subnet A)

MDR Net 2 (TIP TDMA Subnet B)

- Units in Beam 2 join the TIP Supernet. They establish TIP TDMA Subnet B in their beam and join TDMA Subnet A as Rx-only.
- Units in Beam 1 now join TDMA Subnet B as Rx-only.

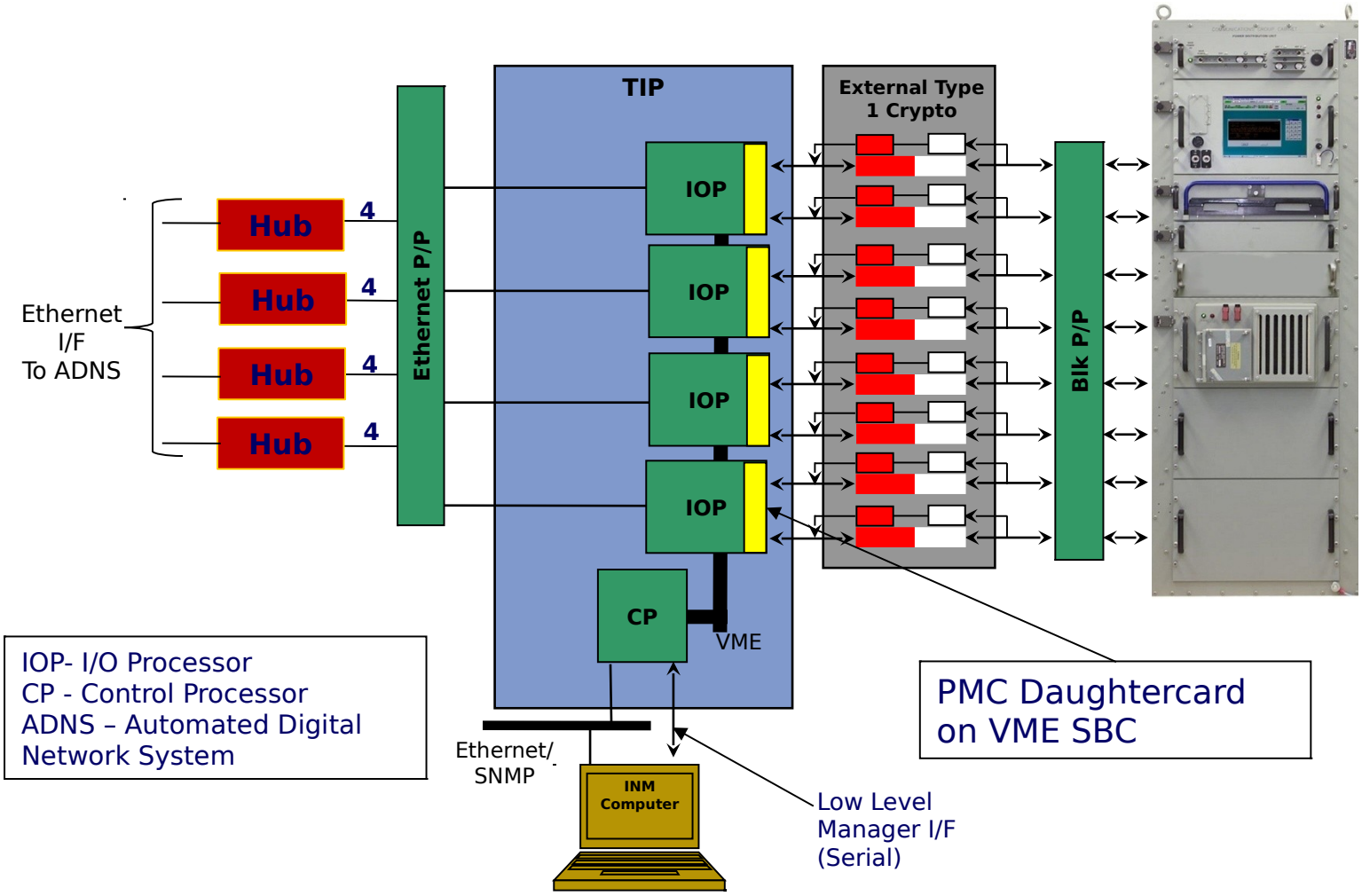
# Multi-Beam, Single Supernet Example (2)




MDR Net 1 (TIP TDMA Subnet A)
MDR Net 2 (TIP TDMA Subnet B)
MDR Net 3 (TIP TDMA Subnet C)

- Units in Beam 3 join TIP Network. They establish TIP TDMA Subnet C at Tx/Rx in their beam and join TDMA Subnets A & B as Rx-only.
- Units in Beam 1 & 2 now join TDMA Subnet C as Rx-only.

# Legacy TIP Architecture



# Legacy TIP Chassis

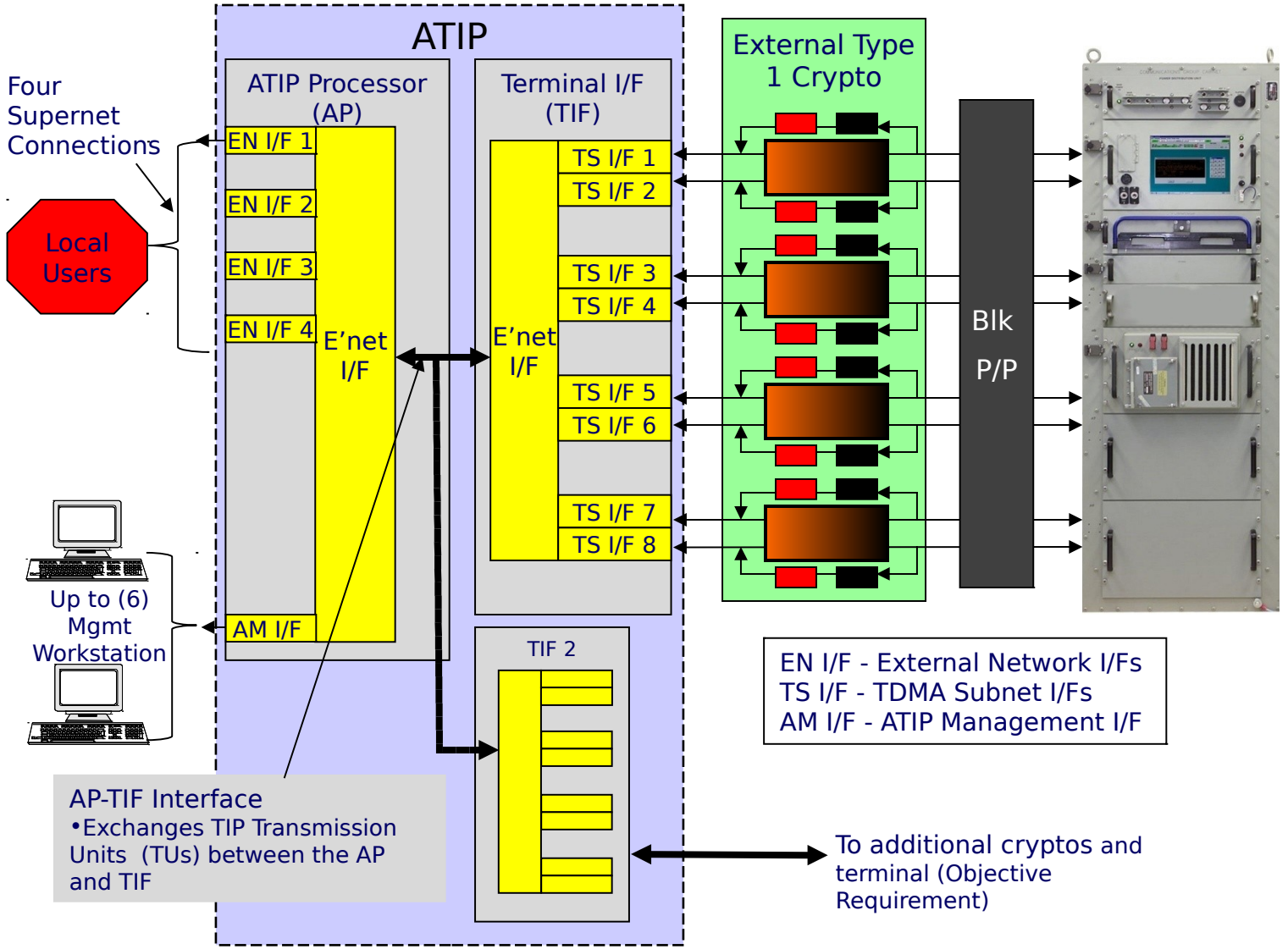
| | |
|---|---|
| **Height:** | **14.00 inches** |
| **Width:** | **19.00 inches** |
| **Depth:** | **19.85 inches** |
| **Weight:** | **80 pounds** |

# ATIP Requirements Overview

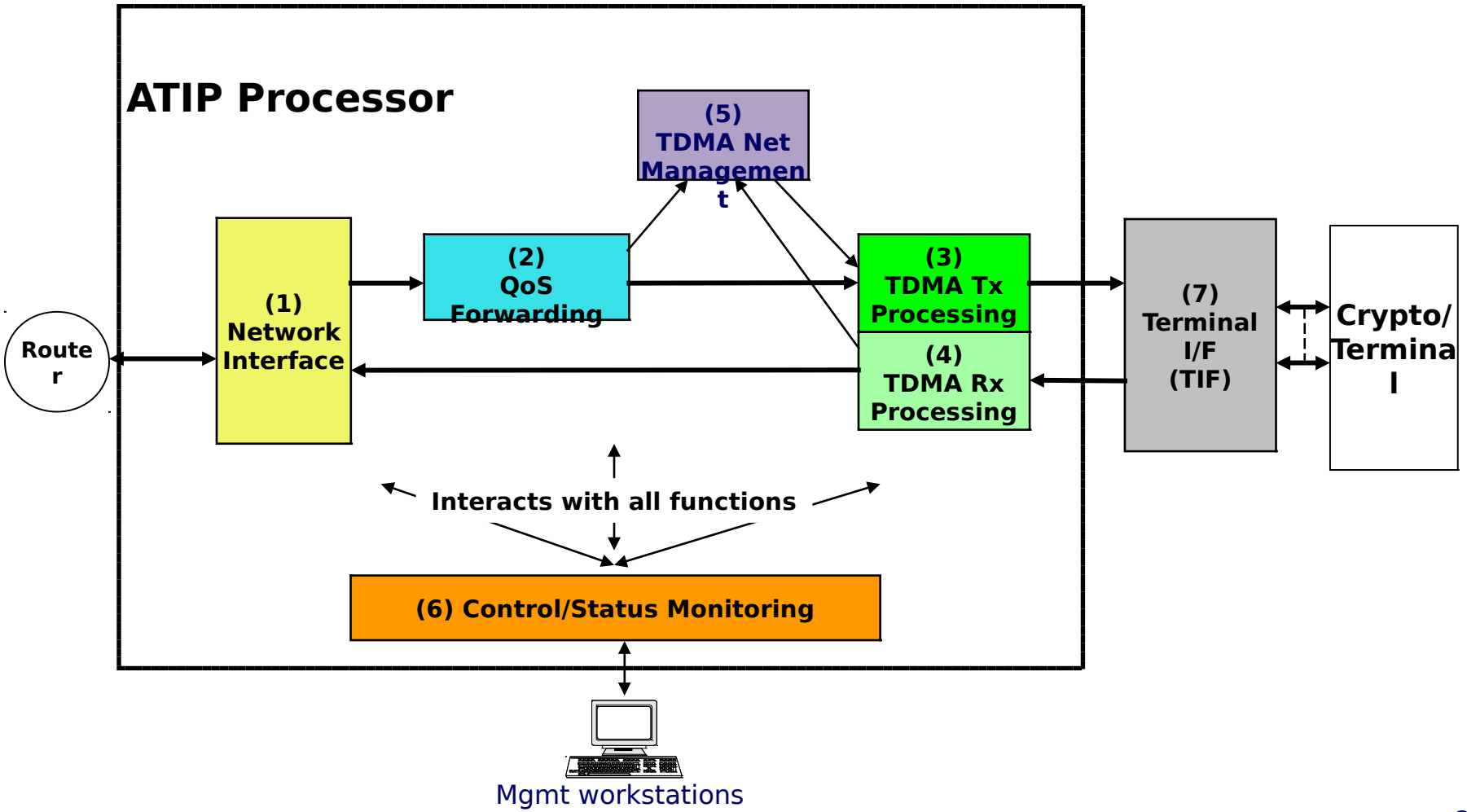
# What is ATIP?

- ATIP is a follow-on capability of the TIP with the following enhancements:
  - Enhanced Quality of Service (e.g., differential services vs. Type of Service)
  - AEHF XDR data rate support (up to 8.192 Mbps)
  - IPv6 Support
  - Web-Based Control
  - ATIP Operator Orderwire
  - More robust Terminal-TIP I/F Timing
- ATIP provides backward compatibility with legacy TIP
- Some TIP requirements are removed for ATIP
  - No support for data rates less than 19.2 KBPS
  - Legacy user serial interface no longer supported

# ATIP Distributed HW/SW Architecture (Multiple TIFs)



# ATIP Functional Architecture



# ATIP Requirements

# ATIP Technical Challenges

- Backwards compatible with Legacy TIP
- Compatible with ADNS Inc. 3
- Tight Coupling between Terminal Uplink timing and TIP TDMA timing has favored keeping TIP relatively close and directly connected to the terminal
  - TIP has known sensitivity to baseband jitter/delay introduced by long TIP/Terminal connections and automated baseband switching subsystems
- Operation at highest AEHF data rates (2.048Mbps – 8.192Mbps) will likely be challenging for installation scenarios where the ATIP and terminal are separated
  - Many Force Level ship/shore site terminals are located some distance from Radio/Tech Control where ATIP would logically be located

# ATIP Software Requirements

- Use commercially available (or public domain) operating system (OS) software
- ATIP Software/firmware update via file upload
- Single software development/image supporting all installations

# Additional System Requirements

- ATIP Specification includes requirements to reduce interface sensitivity
- ATIP Specification allows AP and TIF to be deliberately separated
  - AP and TIF functionality is decoupled
- Specific AP/TIF packaging not mandated
  - Options that allow AP/TIF to be integrated or separated could be proposed
  - AP/TIF interface mandates Ethernet and allows AP-TIF delay to be up to 200ms

# Network Interface (1) Function
## (Section 3.1 – AP Spec)

- Network Interface Function requirements include:
  - Exchange of Ethernet frames with Local Users
    - Supports operation on 10Base-T (HDX/FDX), 100Base-TX, and 1000Base-T
  - Layer-2 filtering/forwarding
  - Supports IPv4/IPv6
  - Single Ethernet interface per Supernet
  - Proxy ARP
  - Flow Control Signaling
  - Tx / Rx Processing

# QoS Processing (2) Function
## (Section 3.2 – AP Spec)

- QoS Processing Function requirements include:
  - Packet classification
  - Scheduling
  - Queue/Rate Reporting
  - Congestion avoidance
  - Policing
- QoS processing is performed separately by each TDMA Subnet member based on dynamic timeslot assignments received from the TDMA Net Controller (NC) via in-band protocols and the Supernet QoS policy

# TDMA Tx Processing (3) Function
## (Section 3.3 – AP Spec)

- TDMA Tx Processing Function requirements include:
  - Determine Transmit Timeslot Opportunities as directed by the Net Controller
  - Build TDMA Transmission Units (TUs)
    - Fragment input packets as needed
  - Output TU to the TIF for transmission in the assigned timeslots

# TDMA Rx Processing (4) Function
## (Section 3.4 – AP Spec)

- TDMA Rx Processing Function requirements include:
  - Process Transmission Units from the TIF
    - Disassemble TU
    - Perform address filtering
    - Perform packet de-fragmentation
    - Build Ethernet frames for output
  - Output packets to the Network Interface Function

# TDMA Net Management (5) Function
## (Section 3.5 – AP Spec)

- TDMA Net Management Function requirements include:
  - Establish TDMA Subnet Cycle
  - Allocate TDMA Timeslots within the Net Cycle in accordance with QoS policy and member-reported queue/rate information
  - Support ATIP-to-ATIP Net Controller / Member protocol processing
    - Member Join/Exit
    - Inactive Member Time-Out
    - Sequence Order List (SOL) Generation/Broadcast
    - Member TDMA Timeslot Reservation

# Control/Status Monitoring (6) Function (Section 3.6 – AP Spec)

- Control/Status Monitoring Function requirements include:
  - Web browser-based management for operator control, management, and monitoring of the ATIP
    - TDMA Supernet/Subnet Configuration/Management
    - AP to TIF interface configuration and equipment status monitoring
    - ATIP will support simultaneous multiple management connections, with one controller and up to five monitor-only connections
  - User authentication and access control
  - Operator-To-Operator Orderwire
  - Software/firmware installation
  - Web interface will be implemented in accordance with Distributed Management Task Force's (DMTF's) Web-Based Enterprise Management (WBEM) standards.

# Terminal Interface (TIF) (7) Function
## (TIF Spec)

- TIF Functions include:
  - Configure serial I/F per Subnet parameters
  - Transmit/Receive TU data to/from the Serial Crypto/EHF Terminal Interfaces
  - Determine transmit clock, TDMA timing, and data
  - Determine receive clock, TDMA timing, and data
  - Interface Status monitoring and reporting

# ATIP Hardware Requirements
## (Section 3.5 – ATIP Overall Spec)

- Use Commercial Off-The-Shelf (COTS) Processor to support AP and TIF capability/software
  - AP and TIF - capable of separate installation using a standard ruggedized air-cooled chassis within a 19” [EIA-310] equipment rack
- Interfaces:
  - Four local user (router) Ethernet interfaces
  - One Management Ethernet interface
  - Eight serial ports for connection to crypto/terminal
- Environmental specs:
  - Operation on Ship, Shore, and Submarine platforms
  - Shock: MIL-STD 901D Grade A, Class I, Type A
  - Vibration: MIL-STD-167-1 for Type I equipment
  - EMI: MIL-STD-461D
  - Operating temperature: 0 – 50$^{o}$ C
  - Humidity: 0 – 95% non-condensing

# ATIP SOW HIGHLIGHTS

# SOW Highlights

- Scope will cover the following:
  - EDM Production and Procurement (SOW section 1.2)
  - Systems engineering (SOW section 3.2)
  - Software design and development (SOW section 3.3)
  - Hardware procurement & development (SOW section 3.4)
  - Hardware and software integration (SOW section 3.5)
  - System security design, development, and certification (SOW section 3.6)
  - System Effectiveness Engineering (SOW section 3.7)
  - Test & Evaluation (T&E) (SOW section 3.8)
  - Software sustainment engineering support (SOW section 3.10)
  - Associated support tasks (SOW sections 3.1 & 3.9)

# EDM Production and Procurement
## (SOW section 1.2)

- Tasks include:
  - Engineering Design Model (EDM) production and delivery
    - Prepare and deliver ten (10) EDM ATIPs
    - Five anticipated for Government delivery
    - Remaining deliver in place
  - Procurement
    - Anticipated production of 300 qualified ATIPs
    - Perform production selloff testing
    - Deliver ATIPs to Government

# Systems Engineering
## (SOW section 3.2)

Tasks include:

- Generate engineering documentation
  - E.g. Software Requirements Specification, Hardware Requirements Specification
- Perform ATIP Quality of Service (QoS)/Forwarding analysis
- Generate Interface Control Documents

# Software Design and Development
## (SOW section 3.3)

- Tasks include:
  - Generate Software Development Plan and Software Configuration Management Plan
  - Design and development of the ATIP software
  - Perform software testing and evaluation
    - Generate Software Test Plan and Software Test Report
  - Maintain and track software trouble reports
  - Provide periodic software development status report

# Hardware Procurement & Development (SOW section 3.4)

- Tasks include:
  - Develop ATIP packaging
    - Maximize use of COTS hardware
  - Procure COTS hardware for AP
  - Design and develop the TIF
  - Minimize qualification testing through COTS use

# Software and Hardware Integration
## (SOW section 3.5)

- Tasks include:
  - Software and hardware integration
    - Generate Software and Hardware Integration Test Plan and Report
  - Maintain and track hardware/software trouble reports

# System Security
## (SOW section 3.6)

- Tasks include:
  - Analyze, design, develop, and test ATIP to meet security requirements as defined in the specification for MAC II, Public IA controls
    - DISA Security Technical Implementation Guides (STIGs)
    - DoDI 8500.2 Information Assurance (IA) Controls

# System Effectiveness Engineering
## (SOW section 3.7)

- Tasks include:
  - Configuration Management
  - Human System Integration
  - Human Factors Engineering
  - Environmental, Safety and Occupational Health
  - Reliability and Maintainability Program

# T&E
## (SOW section 3.8)

- Tasks include:
  - Conduct Design Verification Testing (DVT)
    - Generate DVT Test Plan, Procedures, and Reports
    - Environmental qualification
  - Conduct Production Test (PT)
    - Generate PT Test Plan, Procedures, and Reports
    - Perform First Article Test

# Software Sustainment Support

## (SOW section 3.10)

- Tasks include:
  - Provide software sustainment support for fielded ATIP systems – Est. 5 years
    - Identify software problems and necessary modifications based on Fleet users and/or Government feedback
    - Design and test software changes and modifications
    - Deliver software updates to support field upgrades

# Associated Tasks
## (SOW sections 3.1 & 3.9)

- The following support functions as related to the specific requirements of the task:
  - Program Management
  - Program reviews
    - Program Management Reviews (PMRs)
    - System Design Review
    - Preliminary Design Review
    - Critical Design Review
    - Test Readiness Review
    - Technical Interchange Meetings
  - Integrated Logistics Support (ILS)
    - System Technical Manual
    - Training

# Contractor-Government Data Exchange

- ATIP Requirements captured using DOORS v9.2
- Government desires contractor to use DOORS v9.2 for development progress and requirement traceability
- Exchange of data between contractor and Government would be facilitated by contractor use of DOORS
  - Direct export/exchange of data

# Point Of Contacts

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# We get it.

We also integrate it, install it and support it. For today and tomorrow.